Health Consultation

Evaluation of Surface Soil Samples Collected on Residential and Park Properties near Long Painting Company: South Park Neighborhood

Long Painting Company
Seattle, King County, Washington

July 13, 2001

Prepared by

Washington State Department of Health
Under Cooperative Agreement with the
Agency for Toxic Substances and Disease Registry

Foreword

The Washington State Department of Health (DOH) has prepared this health consultation in cooperation with the Agency for Toxic Substances and Disease Registry (ATSDR). ATSDR is part of the U.S. Department of Health and Human Services and is the principal federal public health agency responsible for health issues related to hazardous waste. This health consultation was prepared in accordance with methodologies and guidelines developed by ATSDR.

The purpose of this health consultation is to identify and prevent harmful human health effects resulting from exposure to hazardous substances in the environment. health consultations focus on specific health issues so that DOH can respond quickly to requests from concerned residents or agencies for health information on hazardous substances. DOH evaluates available site environmental sampling data and/or other site information, determines whether exposures have occurred or could occur, reports any potential harmful effects, and recommends actions to protect public health.

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Glossary

Acute	Occurring over a short period of time. An acute exposure is one which lasts for less than 14 days.
Agency for Toxic Substances and Disease Registry (ATSDR)	The principal federal public health agency involved with hazardous waste issues, responsible for preventing or reducing the harmful effects of exposure to hazardous substances on human health and quality of life. ATSDR is part of the U.S. Department of Health and Human Services.
Aquifer	An underground formation composed of materials such as sand, soil, or gravel that can store and/or supply groundwater to wells and springs.
Cancer Risk Evaluation Guide (CREG)	The concentration of a chemical in air, soil or water that is expected to cause no more than one additional cancer in a million persons exposed over a lifetime. The CREG is a *comparison value* used to select contaminants of potential health concern and is based on the *cancer slope factor* (CSF).
Cancer Slope Factor	A number assigned to a cancer causing chemical that is used to estimate it's ability to cause cancer in humans.
Carcinogen	Any substance that can cause or contribute to the production of cancer.
Chronic	A long period of time. A chronic exposure is one which lasts for more than one year.
Comparison value	A concentration of a chemical in soil, air or water that, if exceeded, requires further evaluation as a contaminant of potential health concern. The terms comparison value and screening level are often used synonymously.
Contaminant	Any chemical that exists in the environment or living organisms that is not normally found there.

Dose	A dose is the amount of a substance that gets into the body through ingestion, skin absorption or inhalation. It is calculated per kilogram of body weight per day.
Environmental Media Evaluation Guide (EMEG)	A concentration in air, soil, or water below which adverse non-cancer health effects are not expected to occur. The EMEG is a *comparison value* used to select contaminants of potential health concern and is based on ATSDR's *minimal risk level* (MRL).
Exposure	Contact with a chemical by ingesting, by breathing, or by direct contact (such as through the skin or eyes). Exposure may be short-term (acute) or long-term (chronic).
Groundwater	Water found underground that fills pores between materials such as sand, soil, or gravel. In aquifers, groundwater often occurs in quantities where it can be used for drinking water, irrigation, and other purposes.
Hazardous substance	Any material that poses a threat to public health and/or the environment. Typical hazardous substances are materials that are toxic, corrosive, ignitable, explosive, or chemically reactive.
Indeterminate public health hazard	Sites for which no conclusions about public health hazard can be made because data are lacking.
Ingestion rate	The amount of an environmental medium which could be ingested typically on a daily basis. Units for IR are usually liter/day for water, and mg/day for soil.
Lowest Observed Adverse Effect Level (LOAEL)	LOAEL's have been classified into "less serious" or "serious" effects. In dose-response experiments, the lowest exposure level at which there are statistically or biologically significant increases in the frequency or severity of adverse effects between the exposed population and its appropriate control.
Maximum Contaminant Level (MCL)	A drinking water regulation established by the federal Safe Drinking Water Act. It is the maximum permissible concentration of a contaminant in water that is delivered to the free flowing outlet of the ultimate user of a public water system. MCLs are enforceable standards.
Media	Soil, water, air, plants, animals, or any other part of the environment that can contain contaminants.

Minimal Risk Level (MRL)	An amount of chemical that gets into the body (i.e., dose) below which health effects are not expected. MRLs are derived by ATSDR for acute (0-14 days), intermediate (15-365 days), and chronic (>1 year) duration exposures by the inhalation and oral routes.
Model Toxics Control Act (MTCA)	The hazardous waste cleanup law for Washington State.
No apparent public health hazard	Sites where human exposure to contaminated media is occurring or has occurred in the past, but the exposure is below a level of health hazard.
No Observed Adverse Effect Level (NOAEL)	The dose of a chemical at which there were no statistically or biologically significant increases in frequency or severity of adverse effects seen between the exposed population and its appropriate control. Effects may be observed at this dose but were judged not to be "adverse."
Oral Reference Dose (RfD)	An amount of chemical ingested into the body (i.e., dose) below which health effects are not expected. RfDs are published by EPA.
Risk	The probability that something will cause injury, linked with the potential severity of that injury. Risk is usually indicated by how many extra cancers may appear in a group of people who are exposed to a particular substance at a given concentration, in a particular pathway, and for a specified period of time. For example, a 1%, or 1 in 100 risk indicates that for 100 people who may be exposed, 1 person may experience cancer as a result of the exposure.
U.S. Environmental Protection Agency (EPA)	Established in 1970 to bring together parts of various government agencies involved with the control of pollution.

Background and Statement of Issues

This health consultation was prepared at the request of the Washington State Department of Ecology (Ecology) to evaluate the results of surface soil samples collected on residential and park properties near the Long Painting Company (LPC), located at 8025 10th Avenue South in Seattle. The soil samples were collected from the properties on October 17, 2000, by a representative of the Public Health-Seattle and King County (SKCPH) Site Hazard Assessment Program in response to citizen concerns about possible contamination of soils in the neighborhood surrounding LPC.[1, 2] Most of LPC's work is reportedly done outside the South Park area, although sandblasting, painting, zinc metallizing, waste storage, and vehicle maintenance activities occur at the company's South Park facility. Paints, solvents, sandblast grit, and petroleum are potential sources of contamination.[1]

The LPC neighborhood is a mixed residential and industrial area in the South Park area of King County. The South Park area is bordered by the Duwamish River to the north and east, State Highway 509 to the west, and South 100th Street to the south (Figure 1).

SKCPH collected a total of 26 soil samples from 16 residences and two park properties (Figure 2). The samples were collected from relatively undisturbed portions of the properties, away from driveways and sides of structures. This was done to minimize the chance of sampling in areas that may have been affected by activities unrelated to LPC, the alleged source. These other possible sources include leaded gasoline, waste oil spills that could contain metals, and/or any historic use of heavy-metal-based paint on the structures.[1] The soil samples were collected from 0 to 2 inches below the ground surface. Grass and other vegetation were removed prior to collecting the samples. All of the soil samples were analyzed for antimony, arsenic, beryllium, cadmium, chromium, copper, lead, nickel, selenium, silver, thallium, and zinc using EPA Method 6010, Hexavalent Chromium by EPA Method 7196, and Mercury by EPA Method 7471.[1]

Slightly elevated levels of two metals (lead and arsenic) were detected in soil samples collected on several residential properties. Neither of the park properties (the South Park Playfield and the Duwamish Waterway Park) revealed elevated metals concentrations. Some soil samples revealed metals concentrations slightly above Puget Sound regional natural background concentrations, but below corresponding health-based levels of concern.

Soil sampling results and corresponding health comparison values are presented in Table 1.

Discussion

Chemical contaminants in the environment can pose a threat to public health, if people come in contact with those contaminants. Knowing or estimating contact people have with chemicals is necessary to assess if chemical contaminants in the environment pose a public health threat.

To determine if people are exposed to contaminants at or from a site, human exposure pathways are evaluated. The five elements of an exposure pathway are:

(1) a source of contaminants,

(2) an environmental media, such as groundwater or soil that contain or move the contamination,

(3) a point where people contact contaminated media, such as a drinking water well or a garden,

(4) an exposure route, such as drinking contaminated well water or eating contaminated soil on homegrown vegetables, and

(5) a population who can come in contact with the contaminants.

A completed exposure pathway is eliminated if at least one of the five elements of a pathway is missing and is not expected to be present. The exposure pathway of concern evaluated in this health consultation is exposure to contaminants in residential and park soils.

Soil sampling results were screened using Agency for Toxic Substances and Disease Registry (ATSDR) health-based comparison values. ATSDR values are media-specific concentrations used to select environmental contaminants for further evaluation. Contaminant concentrations below these values are unlikely to pose a health threat, and were not further evaluated. Contaminant concentrations exceeding these values do not necessarily pose a health threat, but were further evaluated to determine whether they are at levels which could result in adverse health effects. If ATSDR values were not available, Washington State Department of Ecology (Ecology) Model Toxics Control Act (MTCA) Method A or Method B residential soil cleanup levels, or Environmental Protection Agency (EPA) Region 9 Preliminary Remediation Goals (PRGs) for residential soil were used to screen contaminants for further evaluation.

Maximum detected levels of arsenic and lead exceed one or more comparison values and are evaluated below. Thallium is also discussed because the laboratory analytical Practical Quantitation Limit (PQL) for some samples exceeds the corresponding health comparison value. Although the PQL range for beryllium exceeds the comparison value, further evaluation for this metal was not considered necessary because the PQL is below Puget Sound regional natural background levels.

To evaluate the potential for non-cancer health effects, an exposure dose was estimated for each contaminant which exceeded its corresponding health comparison value (i.e., arsenic, lead, and thallium). The estimated exposure doses were then compared to ATSDR's Minimal Risk Level (MRL) or EPA's Oral Reference Dose (RfD). MRLs and RfDs are estimates of daily exposure of a human to a chemical that is likely result in no appreciable non-cancer risk over a specified exposure duration. For screening of chemicals that are known or expected to cause cancer, it is assumed that no "safe" level exists, and EPA cancer slope factors are used to calculate an

estimated increased cancer risk. The slope factor is used to estimate the increased chance of an individual developing cancer as a result of exposure(s) to a particular level of a carcinogen(s). The estimated increased cancer risk is *in addition* to the relatively large proportion of the U.S. population expected to develop cancer sometime during their lives (i.e., one in four).[4]

Arsenic

Soil arsenic concentrations in four residential soil samples exceeded regional natural background concentrations and one or more health comparison values. Arsenic concentrations in the remaining 22 soil samples were below respective laboratory practical quantitation limits (Table 1). The mean arsenic concentration of all soil samples was 18 mg/kg. Locations and concentrations of all arsenic detections is shown on Figure 3.

Arsenic is a mineral commonly found in the environment. Arsenic was used for many years in a variety of pesticide products including its present use as a wood preservative to control wood decaying organisms. Arsenic is also used to increase hardening and heat resistance in glassware and as an anti-fouling agent in boat primers and paints. It is most commonly found in combination with other elements as arsenic ores.[5] Ore deposits, mining activities, and industrial and manufacturing processes are sources of contamination of soil, ground water, and surface waters.[5] The former Ruston and Everett smelters are examples of industrial sources of arsenic which have contributed to its widespread presence in Puget Sound soils. A 1994 Ecology-sponsored study found that the 90th percentile background level of arsenic in Puget Sound soil was 7 mg/kg.[3] However, it is clear that background arsenic levels are higher in many areas of Puget Sound due to the impacts of the former Ruston and Everett smelters.

Non-Cancer Health Effects

The immediate health effects associated with ingestion of high levels of arsenic are primarily abdominal pain, vomiting, and nerve injury. Other symptoms can include leg cramps, restlessness, muscle spasms, and white transverse ridges of the nails. Prolonged exposure to arsenic can result in damage to many parts of the body including the kidneys, blood vessels, and peripheral nerves.[5] *Estimated chronic exposures (i.e., for children assumed to play in arsenic-contaminated soil), were at or below the MRL and RfD, and below the highest level at which no adverse health effects were observed in human chronic oral exposure studies. As a result, non-*

RfDs and MRLs

Oral Reference Doses (RfDs) and Minimal Risk Levels (MRLs) are levels of daily exposure to chemicals below which non-cancer health effects are not expected. MRLs are set by ATSDR for acute, intermediate, and chronic exposure. EPA sets RfDs based on chronic exposure only. An MRL or RfD is derived by dividing a LOAEL or NOAEL by "safety factors" to account for uncertainty and provide added health protection.

cancer health effects would not be expected to result from chronic exposure to the levels of arsenic detected in residential soil.

Another way to evaluate the significance of arsenic levels in soil is to compare the mean soil arsenic level to non-cancer comparison values derived by ATSDR and Ecology. The *mean* concentration of all samples was 18 mg/kg; below the ATSDR non-cancer health comparison value and the MTCA Method A residential soil cleanup level.

Cancer Health Effects

Arsenic is classified by EPA as a Group A (known human) carcinogen.[5, 6] Cancers of the skin, bladder, lung, liver, and kidneys have been associated with ingestion of arsenic.[5] It is important to note that although an estimate of cancer risk can be calculated for *any* level of arsenic in soil, the only evidence of cancer in humans resulted from arsenic exposure greater than would be expected at this site.

Cancer Risk

Cancer risk estimates do not reach zero no matter how low the level of exposure to a carcinogen. Terms used to describe this risk are defined below as the number of additional cancers expected in a lifetime:

Term		# of Additional Cancers
moderate	is approximately equal to	1 in 1,000
low	is approximately equal to	1 in 10,000
very low	is approximately equal to	1 in 100,000
slight	is approximately equal to	1 in 1,000,000

Chronic ingestion of arsenic at the levels detected were estimated to result in a very low increased cancer risk. It is important to note that although a very low increased cancer risk was estimated under this conservative exposure scenario, some of the estimated risk can be accounted for by background levels of arsenic in Puget Sound regional soils. Additionally, only four of the 26 soil samples revealed detectable levels of arsenic. Based on the results of the limited-scale yard soil sampling, residents are unlikely to develop cancer from arsenic in soil.

Lead

Lead was detected in 25 of the 26 soil samples tested.[7] Lead concentrations in only two of the samples exceeded state soil cleanup or federal soil screening values (Washington Model Toxics Control Act Method A residential soil cleanup level, and EPA residential soil screening level, respectively), and were further evaluated. The locations and concentrations of lead in all soil samples is shown in Figure 4.

Lead is a metal found throughout the environment. Human exposures in the United States today are primarily associated with lead-based paint during renovation of older buildings, mining, and processing activities. The use of lead compounds in gasoline, batteries, pipes, ammunition and paint has contributed to the widespread dispersion of lead in air, soil, and water. More recently, the

electronic industry has increased its usage of lead in the areas of magnetic imaging, transistors, night vision equipment, and energy generation. As a result of its widespread use, everyone has some lead in their bodies.[8] Primary non-occupational exposure routes of concern are ingestion and inhalation of indoor house dust contaminated with lead from chipped and peeling lead-based paint, and exposure to lead in soil. Lead in drinking water that leaches from solder in old plumbing is another potential source. With sufficient exposure, these man-made sources of lead in the environment can increase the amount of lead in our bodies to toxic levels. Children under 6 years of age are considered most susceptible to lead exposure and toxicity.[8]

Non-Cancer Health Effects

The non-cancer effects of lead are well known. At high doses, lead can cause severe toxicity to the brain, referred to as encephalopathy. Lower doses have caused peripheral nervous system toxicity, kidney damage, blood disorders, hearing and vision impairment, and effects on muscle coordination. Lead also damages the heart and reproductive system. The most sensitive toxic effect of lead poisoning is believed to be impaired development of the central nervous system in children and the unborn. This effect has been measured by observing behavioral changes in children, including performance in school, as measured by decreased performance on IQ tests.[8] These changes have been measured at very low levels of lead in the blood. No safe level of lead in blood has been established for these types of effects, although the Centers for Disease Control (CDC) level of concern is 10 micrograms of lead per deciliter (μg/dl) of blood. Children whose blood-lead level exceeds this are considered to be at risk and should have their exposure reduced. Evidence exists indicating that health effects in young children may occur at blood-lead levels as low as 6 μg/dl.

To evaluate the likelihood of elevated blood-lead levels for children assumed to be chronically exposed to soil containing the elevated lead detections, DOH used the EPA Integrated Exposure Uptake Biokinetic Model for Lead in Children (IEUBK).[9] *Blood-lead levels in children assumed to be chronically exposed to even the highest detected concentration of lead in soil are not expected to exceed CDC's 10 μg/dl blood-lead level of concern*[10] (Table 2).

Cancer Health Effects

The EPA has classified lead as a Group B2 (probable human) carcinogen.[6, 8] This classification was based on *sufficient* evidence of cancer in animals and *inadequate* evidence in humans. Several studies have shown that high doses of lead in laboratory animals can cause kidney tumors.[6, 8]

Estimated exposures for children or adults assumed to be chronically exposed to even the highest detected soil lead level is well below the cancer effect level reported in the scientific literature.[8] As a result, cancer would not be expected to result from this exposure.

Thallium

Thallium was not detected in any of the 26 soil samples tested.[7] However, because the range of analytical practical quantitation limits (PQLs) for thallium for a number of the samples slightly exceeded a corresponding health comparison value (i.e., 5.6 mg/kg MTCA method B residential soil cleanup level), DOH conservatively assumed that these samples contained thallium at a concentration of 7.8 mg/kg (the high end of PQL range).

Thallium is used mostly in manufacturing electronic devices, switches, and closures, primarily for the semiconductor industry. It also has limited use in the manufacture of special glass and for certain medical procedures.[10] DOH could not find any information in the scientific literature which indicates that it was or is currently used as a constituent in paint.

Non-Cancer Health Effects

No information is available on health effects in humans after chronic exposure to low levels of thallium. Exposure to high concentrations of thallium include effects upon the nervous system, lungs, heart, liver, and kidneys. Exposure to extremely high levels can result in temporary hair loss, vomiting, and diarrhea. Birth defects observed in children of mothers exposed to small amounts of thallium did not occur more often than would be expected in the general population, although the length of time and the mother's precise exposure were not known. As in humans, animal studies indicate that exposure to large amounts of thallium for brief periods of time can damage the nervous system, heart, and can cause death. Animal reproductive organs, especially the testes, were affected after oral exposure to thallium-contaminated water. These effects have not been seen in humans.[10]

Estimated exposures are well below EPA's oral reference dose for thallium . As a result, exposure is not expected to result in non-cancer health effects.

Cancer Health Effects

The Department of Health and Human Services, the International Agency for Research on Cancer, and the Environmental Protection Agency (EPA) have not classified thallium as to its human carcinogenicity.[6, 10] No studies were located in the scientific literature regarding the development of cancer in humans or animals after inhalation, oral, or dermal exposure to thallium. In the absence of epidemiological studies or long-term animal bioassays, the potential for thallium to cause cancer in humans cannot be determined.[10]

Multiple Chemical Exposure

A person can be exposed by more than one pathway and to more than one chemical. Exposure to multiple pathways occur when a contaminant is present in more than one medium (i.e., air, soil, surface water, groundwater, and/or sediment). For example, the dose of a contaminant received from drinking water may be combined with the dose received from contact with that same contaminant in soil. DOH evaluated the likelihood of adverse health effects assuming a child or adult was chronically exposed to the three contaminants of concern evaluated. *The combined effect from exposure to all of the contaminants of concern evaluated is not expected to result in*

additional increased cancer or non-cancer health effects. Additionally, the elevated soil metal levels were from different locations, making concurrent, chronic exposures unlikely.

Child Health Initiative: Developmental/Reproductive Effects

ATSDR's Child Health Initiative recognizes that the unique vulnerabilities of infants and children deserve special emphasis with regard to exposures to environmental contaminants. Infants, young children, and the unborn may be at greater risk than adults from exposure to particular contaminants. Exposure during key periods of growth and development may lead to malformation of organs (teratogenesis), disruption of function, and even premature death. In certain instances, maternal exposure, via the placenta, could adversely effect the fetus. After birth, children may receive greater exposures to environmental contaminants than adults. Children are often more likely to be exposed to contaminants from playing outdoors, ingesting food that has come into contact with hazardous substances, or breathing soil and dust. Pound for pound body weight, children drink more water, eat more food, and breathe more air than adults. For example, in the United States, children in the first six months of life drink seven times as much water per pound as the average adult. The implication for environmental health is that, by virtue of children's lower body weight, given the same exposures, they can receive significantly higher relative contaminant doses than adults.

DOH evaluated the likelihood of adverse health effects for infants or young children (those at greatest risk) assumed to be exposed to the contaminants of concern evaluated in the health consultation (lead, arsenic, and thallium). No adverse developmental or reproductive health effects would be expected for children assumed to be exposed to the detected contaminants in soil. As noted above, the most sensitive toxic effect of lead poisoning is believed to be impaired development of the central nervous system in children and the unborn. Modeling indicated that lead levels detected in residential soil are not expected to pose a developmental health threat to infants or young children.

Conclusions

1. The concentrations of metals in soil samples collected from residential and park properties near the Long Painting Company pose a *no apparent public health hazard* to exposed or potentially exposed persons. This health hazard category is used when human exposure to contaminated media is occurring, or has occurred in the past, but the exposure is below a level of health hazard.

2. Arsenic levels in soil samples collected from several residential properties were elevated and pose a very low increased risk of developing cancer for persons conservatively assumed to be chronically exposed. Some of this estimated increased risk can be accounted for by arsenic's widespread presence in Puget Sound regional soils. The mean arsenic concentration of all soil samples (18 mg/kg) was considerably lower than the 48 mg/kg maximum concentration. Arsenic was not found above laboratory quantitation limits in the majority (85%) of samples.

3. The results of EPA's blood-lead model indicate that exposure to lead levels measured in soil at residential and park properties does not pose a hazard for infants and children (those most susceptible) or adults assumed to be chronically exposed.

4. The purpose of the sampling investigation was to evaluate concentrations of metals in residential and park properties as a result of community health concerns, not to evaluate possible *source(s)* of the metals. Although the highest concentrations of some metals occurred in the immediate vicinity of LPC, there is insufficient information to establish a link between the elevated metals detected in some surface soil samples and the LPC.

Recommendations and Public Health Action Plan

1. Copies of this health consultation will be provided to residents whose homes were tested, Public Health-Seattle and King County, Long Painting Company, Puget Sound Clean Air Agency, the Department of Construction and Land Use, the Community Coalition for Environmental Justice, and others. Upon request, additional copies of this health consultation are available.

2. Area residents have expressed concerns about potential health impacts from LPC air emissions. DOH has been working closely with the Department of Ecology and the Puget Sound Clean Air Agency, and recently completed a separate health consultation report which evaluated this issue.[24] DOH concluded that air emissions from LPC pose an indeterminate health hazard due to insufficient air emissions information. As a result, DOH is recommending air emissions sampling which would provide better information in which to evaluate potential residential health risks. The air emissions health consultation will be mailed to agencies and area residents, among others.

3. DOH has prepared a fact sheet which summarizes the findings of each of the three LPC health consultations prepared since 1999. The fact sheet is being mailed to residents who live near LPC, agency representatives, and other interested parties.

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Appendix A

Table 1
October 17, 2000 Soil Sampling Results and Corresponding Health Comparison Values
(concentrations are in mg/kg)

Analyte	Concentration Range	PQL Range	# of Sample Detections	# of Samples exceeding CV	90th % Puget Sound Natural Background Concentration[3]	*Cancer CV	Non-cancer CV (child/adult)
Antimony	ND	5.1 - 7.8	None	None	NA	NA	20/300
Arsenic	ND - 48	10 - 16	4/26	4	7	0.05 (CREG)	20 (child EMEG) 200 (adult EMEG)
Beryllium	ND	0.26 - 0.39	None	None	0.6	0.233 (MTCA B)	100/1,000
Cadmium	ND - 1.5	0.51 - 0.78	6/26	None	1	NA	10/100
Total Chromium	5 - 39	0.51 - 0.78	26/26	None	48	NA	210 (EPA Region 9)
Copper	6.3 - 94	0.51 - 0.78	26/26	None	36	NA	2,960 (MTCA B)
Lead	ND - 410	5.1 - 7.8	25/26	2	24	NA	250 (MTCA A) 400 (EPA Region 9)
Mercury	ND	0.26 - 0.39	None	None	0.07	NA	24 (MTCA B)
Nickel	3 - 19	1 - 1.6	26/26	None	48	NA	1,000/10,000
Selenium	ND	10 - 16	None	None	NA	NA	300/4,000
Silver	ND - 2	0.51 - 0.78	1/26	None	NA	NA	300/4,000
Thallium	ND	5.1 - 7.8	None	None	NA	NA	5.6 (MTCA B)
Zinc	30 - 510	2.6 - 3.9	26/26	None	85	NA	20,000/200,000
Hexavalent Chromium	ND	0.09 - 0.14	None	None	NA	0.2**	400 (MTCA B) 19 (MTCA A)***

* CV = ATSDR or EPA residential soil health comparison value or Model Toxics Control Act residential soil cleanup level
** California modified PRG, 1994
*** Proposed MTCA Method A soil cleanup level for unrestricted land use based on protection of ground water for drinking water use
NA = Not available
ND = Not detected
PQL range = Range of laboratory analytical practical quantitation limits
Shaded cell = concentration which exceeds one or more CVs

Table 2
Environmental Protection Agency Uptake/Biokinetic Model for Lead (Version 0.99d)[9]
Calculated Blood-Lead Levels

Age (Years)	Maximum Detected Soil Lead Concentration (mg/kg)	CDC's Blood-Lead Level of Concern (µg/dl)	*Estimated Blood-Lead Level (µg/dl)
0.5 - 1	**410**	**10**	**5.2**
1 - 2	**410**	**10**	**5.8**
2 - 3	**410**	**10**	**5.4**
3 - 4	**410**	**10**	**5.1**
4 - 5	**410**	**10**	**4.3**
5 - 6	**410**	**10**	**3.7**
6 - 7	**410**	**10**	**3.3**

* The estimated blood-lead level from EPA's blood-lead model includes lead contribution from soil, as well as from dust, air, water, and diet.

Appendix B

Figure 1 Vicinity Map: Long Painting Company Neighborhood, Seattle, WA

Figure 2 Surface soil sampling locations: Long Painting Company Neighborhood, Seattle, WA

Figure 3 Surface Soil Arsenic Results: Long Painting Company Neighborhood, Seattle, WA

Figure 4 Surface Soil Lead Results: Long Painting Company Neighborhood, Seattle, WA

Certification

This Health Consultation was prepared by the Washington State Department of Health under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR). It is in accordance with approved methodology and procedures existing at the time the health consultation was begun.

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The Division of Health Assessment and Consultation, ATSDR, has reviewed this public health consultation and concurs with the findings.

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